

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application.

1. (Currently Amended) A heat exchanger including plate fins and tubes comprising:

a plurality of fins stacked at respective intervals; and

a plurality of heat exchanger tubes penetrating each of said fins in a fin-stacking direction, said heat exchanger exchanging heat between a first fluid flowing inside said heat exchanger tubes and a second fluid flowing outside said heat exchanger tubes, wherein

each of said fins includes a main body that is substantially planar and a plurality of cut-raised portions extending from said main body and disposed at an upstream side of flow of the second fluid with respect to said heat exchanger tubes,

each of said cut-raised portions corresponds to a respective heat exchanger tube and includes first and second opposed side ends connected to the main body of said fin, ~~the first side end-being is~~ nearer to the corresponding heat exchanger tube ~~and-being~~ than is the second side end, the first side end is longer than the first second side end, and the first side end is disposed at a downstream side of the flow of the second fluid, facing the corresponding heat exchanger tube,

said cut-raised portions are disposed only within one of a plurality of regions of said fin, and ~~each of said regions-being is~~ centered about a respective heat exchanger tube ~~and-satisfying~~ satisfies

$$W_s = (1 - \phi) D_p + \phi D$$

$$1.0 \geq \phi > 0.5,$$

W_s is the width of each of said regions corresponding to respective heat exchanger tubes in a column direction that extends parallel to an edge of each of said fins,

D is the outer diameter of each of said heat exchanger tubes,

D_p is the pitch of said heat exchanger tubes in the column direction,

no cut-raised portion is present in an area of said fin centered, in the column direction, between adjacent pairs of said heat exchanger tubes and having a width W_f , in the column direction, satisfying

$$W_f = \phi (D_p - D), \text{ and}$$

$$W_f + W_s = D_p;$$

each of said cut-raised portions includes first and second opposite edges respectively disposed at the upstream and downstream sides of the flow of the second fluid, and

each of said first and second edges extends obliquely relative to the column direction.

2. (Currently Amended) The heat exchanger according to claim 1, wherein said cut-raised portions corresponding to each of said heat exchanger tubes are disposed only in a region of said fins which falls within 130 degrees of a central angle of the corresponding heat exchanger tube, toward upstream and downstream ~~directions~~ sides of the flow of the second fluid.

Claim 3 (Cancelled).

4. (Currently Amended) The heat exchanger according to claim 1, wherein ~~each of said cut-raised portions has two opposite edges disconnected from said main body of the corresponding fin,~~ at least one of said first and second edges ~~extending~~ extends in a radial direction of the corresponding heat exchanger tube.

5. (Previously Presented) The heat exchanger according to claim 1, including a further cut-raised portion having two opposed side ends connected to said main body of the corresponding fin, wherein at least one of said side ends of said further cut-raised portion extends in a direction perpendicular to the column direction.

6. (Previously Presented) The heat exchanger according to claim 1, including at least two of said cut-raised portions for each of said heat exchanger tubes, said cut-raised portions being disposed symmetrically with respect to an axis that passes through the center of the corresponding heat exchanger tube and that extends in a direction perpendicular to the column direction.

7. (Previously Presented) The heat exchanger according to claim 1, wherein each of said cut-raised portions has a shape raised alternately in a longitudinal direction of said heat exchanger tubes.

8. (Previously Presented) The heat exchanger according to claim 1, wherein each of said fins includes a convex protrusion continuously extending in the column direction.

9. (Currently Amended) The heat exchanger according to claim 1, wherein each of said cut-raised portions is cut and raised from said main body of said fin to form a bridge shape which has ~~a leg segment~~ segments connected to said main body, and a beam segment spaced apart from said main body.

10. (Currently Amended) The heat exchanger according to claim 1, wherein ~~each of said cut-raised portions includes~~ first and second opposed edges are not directly connected to said main body of said fin, ~~the said first edge being nearer to an upstream side of flow of the second fluid flowing across said fin and being longer than the said second edge.~~ the said first edge being nearer to an